

The following Listing of Claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS:

1. (Cancelled)
2. (Cancelled)
3. (Currently Amended) ~~The A method as set forth in claim 1, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the method comprising the steps of
detecting a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;
determining whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and
heating-up the heat radiation device upon determination that the oil temperature is equal to or less than the predetermined reference temperature,
the detecting of the temperature of the oil is being carried out by estimating an oil temperature from a rotational speed of the motor when a pressure is controlled.

4. (Currently Amended) ~~The A method as set forth in claim 1, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the method comprising the steps of

detecting a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

determining whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and

heating-up the heat radiation device upon determination that the oil temperature is equal to or less than the predetermined reference temperature,

the detecting of the temperature of the oil is being carried out by estimating an oil temperature from a pressure when a flow rate is controlled.

5. (Currently Amended) The method as set forth in claim 2 15, wherein the controlling of the radiator fan for lowering the heat radiation efficiency is carried out by decreasing a rotational speed of the radiator fan or stopping the radiator fan.

6. (Previously Presented) A method for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit being arranged to drive a fixed volume hydraulic pump using an integral-type motor controlled by an inverter, the method comprising the steps of

detecting a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

determining whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and

shifting a current phase from an optimum current phase for increasing heat generation of the motor upon determination that the oil temperature is equal to or less than the predetermined reference temperature.

7. (Previously Presented) The method as set forth in claim 6, wherein the motor is a brushless DC motor, and the shifting of the current phase from the optimum current phase is carried out by shifting the current phase in a leading phase side with respect to a speed electromotive force so as to increase a maximum revolution.

8. (Cancelled)

9. (Currently Amended) The apparatus as set forth in claim 8 10, wherein the heat radiation device includes a radiator, the warm up device includes a radiator fan controlling device configured and arranged to control a radiator fan, and the radiator fan is configured and arranged to lower a heat radiation efficiency of the radiator in response to the determination obtained by the temperature determining device indicating that the oil temperature is equal to or less than the predetermined reference temperature.

10. (Currently Amended) ~~The~~ An apparatus ~~as set forth in claim 8, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the apparatus comprising:
an oil temperature detection device configured and arranged to detect a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;
a temperature determining section configured and arranged to determine whether or not the detected oil temperature is equal to or less than a predetermined reference temperature;
and
a warm up device configured and arranged to heat -up the heat radiation device in response a determination by the temperature determining section that the oil temperature is equal to or less than the predetermined reference temperature,
the oil temperature detection device is being configured and arranged to carry out detection of the oil temperature by estimating an oil temperature from a rotational speed of the motor when a pressure is controlled.

11. (Currently Amended) ~~The~~ An apparatus ~~as set forth in claim 8, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the apparatus comprising:

an oil temperature detection device configured and arranged to detect a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

a temperature determining section configured and arranged to determine whether or not the detected oil temperature is equal to or less than a predetermined reference temperature;

and

a warm up device configured and arranged to heat -up the heat radiation device in response a determination by the temperature determining section that the oil temperature is equal to or less than the predetermined reference temperature.

the oil temperature detection device is being configured and arranged to carry out the detection of an oil temperature by estimating an oil temperature from a pressure when a flow rate is controlled

12. (Currently Amended) The apparatus as set forth in claim 9 17, wherein the radiator fan controlling device is configured and arranged to ~~decreases~~ decrease a rotational speed of the radiator fan or stops the radiator fan for lowering the heat radiation efficiency.

13. (Previously Presented) An apparatus for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit being arranged to drive a fixed volume hydraulic pump using an integral-type motor controlled by an inverter, the apparatus comprising:

an oil temperature detection device configured and arranged to detect a temperature of the oil flowing along a circulation flow path;

a temperature determining section configured and arranged to determine whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and

a current phase controlling device configured and arranged to shift for a current phase from an optimum current phase for increasing heat generation of the motor in response to a determination of the temperature determining section indicating that the oil temperature is equal to or less than the predetermined reference temperature.

14. (Previously Presented) The apparatus as set forth in claim 13, wherein the motor is a brushless DC motor, and the current phase controlling device configured and arranged to shift a current phase from an optimum current phase by shifting a current phase in a leading phase side with respect to a speed electromotive force so as to increase a maximum rotational speed.

15. (Currently Amended) ~~The A method as set forth in claim 2, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the method comprising the steps of

detecting a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

determining whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and

heating-up the heat radiation device upon determination that the oil temperature is equal to or less than the predetermined reference temperature, the heating-up of the heat radiation device being carried out by controlling a radiator fan so as to lower a heat radiation efficiency of a radiator that is used as the heat radiation device,

the detecting of the temperature of the oil is being carried out by estimating an oil temperature from a rotational speed of the motor when a pressure is controlled.

16. (Currently Amended) ~~The A method as set forth in claim 2, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the method comprising the steps of

detecting a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

determining whether or not the detected oil temperature is equal to or less than a predetermined reference temperature; and

heating-up the heat radiation device upon determination that the oil temperature is equal to or less than the predetermined reference temperature, the heating-up of the heat radiation device being carried out by controlling a radiator fan so as to lower a heat radiation efficiency of a radiator that is used as the heat radiation device,

the detecting of the temperature of the oil is being carried out by estimating an oil temperature from a pressure when a flow rate is controlled.

17. (Currently Amended) ~~The An~~ apparatus as set forth in claim 9, wherein for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the apparatus comprising:

an oil temperature detection device configured and arranged to detect a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

a temperature determining section configured and arranged to determine whether or not the detected oil temperature is equal to or less than a predetermined reference temperature;

and

a warm up device configured and arranged to heat -up the heat radiation device in response a determination by the temperature determining section that the oil temperature is equal to or less than the predetermined reference temperature,

the heat radiation device including a radiator,

the warm up device including a radiator fan controlling device configured and arranged to control a radiator fan,

the radiator fan being configured and arranged to lower a heat radiation efficiency of the radiator in response to the determination obtained by the temperature determining device indicating that the oil temperature is equal to or less than the predetermined reference temperature, and

the oil temperature detection device is being configured and arranged to carry out detection of the oil temperature by estimating an oil temperature from a rotational speed of the motor when a pressure is controlled.

18. (Currently Amended) ~~The An~~ apparatus ~~as set forth in claim 9, wherein~~ for warm up control of an autonomous inverter-driven hydraulic unit, the autonomous inverter-driven hydraulic unit driving a fixed volume hydraulic pump using a motor controlled by an inverter, having a heat radiation device provided at a predetermined position of a circulation flow path of an oil which is discharged by the fixed volume hydraulic pump, the apparatus comprising:

an oil temperature detection device configured and arranged to detect a temperature of the oil flowing along the circulation flow path to obtain a detected oil temperature;

a temperature determining section configured and arranged to determine whether or not the detected oil temperature is equal to or less than a predetermined reference temperature;

and

a warm up device configured and arranged to heat -up the heat radiation device in response a determination by the temperature determining section that the oil temperature is equal to or less than the predetermined reference temperature,

the heat radiation device including a radiator,

the warm up device including a radiator fan controlling device configured and arranged to control a radiator fan,

the radiator fan being configured and arranged to lower a heat radiation efficiency of the radiator in response to the determination obtained by the temperature determining device indicating that the oil temperature is equal to or less than the predetermined reference temperature, and

the oil temperature detection device is being configured and arranged to carry out the detection of an oil temperature by estimating an oil temperature from a pressure when a flow rate is controlled.

19. (New) The method as set forth in claim 16, wherein
the controlling of the radiator fan for lowering the heat radiation efficiency is carried
out by decreasing a rotational speed of the radiator fan or stopping the radiator fan.

20. (New) The apparatus as set forth in claim 18, wherein
the radiator fan controlling device is configured and arranged to decrease a rotational
speed of the radiator fan or stops the radiator fan for lowering the heat radiation efficiency.